ADVERTISEMENT FOR BIDS

Plant SCADA PLC System Upgrade for Water Treatment Plant

CITY OF STATESVILLE

The City of Statesville will be receiving proposals for an upgraded SCADA PLC System for the Water Treatment Plant. Proposals will be received at 232 Pump Station Rd. Statesville, NC 28677, on or before **2:00 PM, THURSDAY, December 29, 2022**. Bidder is responsible for timely delivery of their bid. The City reserves the right to waive any informalities and to reject any or all proposals.

For bidding documents, notifications, and/or instructions, visit our website at: www.statesvillenc.net/bidpostings.

PRE-BID NOTICE

A **MANDATORY** pre-bid meeting will be held **9:00 AM, Thursday, December 15, 2022,** at 232 Pump Station Rd. Statesville, NC 28677. The purpose of this meeting is to visit all sites and answer any questions about the project. The City will not entertain bids from firms who do not have a representative attend the pre-bid. A sign-in sheet will serve as the attendance record.

Eva Mendez
Purchasing Agent

Harry Hull
Water Plant Supervisor

Published: November 29, 2022

Request for Proposals
For
Plant SCADA PLC System Upgrade
City of Statesville NC Water Treatment Plant

I. PURPOSE

A. The City of Statesville is seeking proposals from firms to upgrade the existing Supervisory Control and Data Acquisition (SCADA) Primary Logic Control (PLC) System for the City's Water Treatment Plant (WTP). Upon completion, the system will communicate and aid in plant operations and communicate with telemetry from remote sites for overall system monitoring and control.

II. SCOPE OF SUPPLY

A. The selected firm will install fully operational SCADA PLC System at the City of Statesville Water Treatment Plant. The SCADA hardware shall be installed and utilized for control and monitoring from local WTP SCADA workstations.

B. Full system requirements are detailed in the document:

"City of Statesville – WTP SCADA PLC System Upgrade Specifications"

III. CONTENT OF PROPOSALS

A. Each interested firm must submit one proposal in a sealed envelope in accordance with the deadline and delivery address specified in the "Proposal Submittal" section of this RFP.

a. Proposals shall include the following:

1. A concise description of the firm's background and experience with similar projects.
2. List of equipment proposed, including manufacturer and model numbers, when the equipment is not directly specified.
3. References from a minimum of three previous representative systems installed during the previous 5 years.
4. Fixed lump sum cost to provide the proposed SCADA PLC System Upgrade hardware, installation, and startup.

IV. RANKING OF PROPOSALS

A. Proposals will be evaluated under the following criteria:

a. Qualifications and experience of firm;
b. References from previous clients including satisfaction with system performance, reliability, and quality of service;
c. Understanding of the project, scope of services to be provided, and the proposed overall approach;
d. Overall proposal price

V. SELECTION PROCEDURE

A. The City will review all proposals. The City may elect to hold interviews with at least two highest ranked firms, or it reserves the right to select, in writing, a firm it feels is clearly more qualified than others based on the proposals.

VI. INSTRUCTIONS TO OFFERORS SUBMITTING PROPOSALS

A. A MANDATORY pre-bid meeting is set for December 15, 2022, at 9am. All firms must have a representative at the pre-bid meeting to be allowed to submit a proposal. Any firm arriving after 9am on December 15, 2022, will not be permitted to enter the pre-bid meeting. NO EXCEPTIONS. The pre-bid meeting will visit all sites and answer any questions that may arise.

B. **Proposing firms shall submit one printed copy no later than 2:00 p.m. on December 29, 2022. At this time all received proposals will be opened.** Printed proposals shall be provided in sealed envelope clearly marked "SCADA PLC System Upgrade". Proposing firms are responsible for confirming that their proposal has been received**. USPS should not be used.**

Proposals shall be addressed to:

Harry Hull
Water Plant Supervisor
City of Statesville
232 Pump Station Road
Statesville, North Carolina 28677
704-878-3441
hhull@statesvillenc.net

VII. GENERAL PROVISIONS

A. Offeror's Representations:

a. Each offeror, by submitting a proposal in response to this request for proposals, represents that the offeror has read and understands the contract specifications and has familiarized himself with all federal, state and local laws, ordinances, rules and regulations that in any manner may affect the cost, progress or performance of the work.

b. The failure or omission of any offeror to receive or examine any form, instrument, addendum, or other documents, or to acquaint himself with conditions existing in City, shall in no way relieve any offeror from any obligations with respect to his proposal or to the contract.

B. Addenda:

a. **If any party contemplating the submission of a proposal on this request for proposal is in doubt as to the meaning of any part of the plans, specifications, or other documents, they should submit a written request for an interpretation by 2pm December 22, 2022, thereof to the Water Plant Supervisor and addenda will be issued by 2pm December 23, 2022.** Typically, an interpretation of the contract specifications will be made only by addendum duly issued to each party receiving a request for proposal. Addenda will be available at the City offices for review by any interested party. The City will not be responsible for explanations or interpretations of contract specifications except as issued by addendum.

b. Any changes to the request for proposal and contract specifications will be in the form of a written addendum from the City which shall be signed by the City's duly authorized representative.

c. Each offeror shall be responsible for determining that all addenda issued by the City for the request for proposals have been received before submitting a proposal for the work.

d. Each offeror shall acknowledge the receipt of each addendum in his proposal.

e. Unless otherwise instructed by a potential offeror, the City will issue addenda by email, wherever practicable. If the City does not know a potential offeror's email address, or if emailing is impracticable, it will be offerors responsibility to obtain the addenda and submit signed with proposal.

C. Modification of Proposal:

a. A proposal may be modified or withdrawn by the offeror any time prior to the time and date set for the receipt of proposals. The offeror shall notify the City in writing of his intentions.
b. Modified and withdrawn proposals may be resubmitted to the City up to the time and date set for the receipt of proposals.

D. Award of Contract:

a. The City reserves the right to waive any informality in proposals and to reject any or all proposals. Chosen firm will be contacted once all city purchasing guidelines have been met and a contract with Purchase Order is issued. Bid tab will be emailed to all firms issuing a proposal. Do not contact the city until after receipt of bid tab.
b. The contract documents shall be subject to and governed by the laws of the State of North Carolina and the City of Statesville. Any dispute arising out of the contract documents, their performance, or their interpretation shall be litigated only in the Circuit Court of the County of Iredell, North Carolina.

E. Successful Offeror's Performance:

a. The successful offeror shall furnish all labor, materials, and equipment necessary to fulfill the requirements of the contract in strict compliance with the terms, conditions, specifications and drawings of his proposal and the contract documents. Parts and consumables may be charged to the City, but unless it would be impracticable to do so, the City will be given the opportunity to purchase parts and consumables directly.
b. The successful offeror agrees and covenants that his agents and employees shall comply with all City, County, State and Federal laws, and rules and regulations applicable to the business to be conducted under the contract.
c. The successful offeror shall ensure that his employees observe and exercise all necessary caution and discretion so as to avoid injury to person or damage to property of any and all kinds.
d. The successful offeror shall cooperate with City officials in performing the work so that interference with existing City operations will be held to a minimum.
e. The successful offeror agrees and covenants that he or she shall indemnify and hold the City and its employees and agents harmless against and from all liability, claims, damages and costs, including attorneys' fees of every kind attributable to bodily injury, sickness, disease or death or to damage to or destruction of property resulting from or in any manner arising out of or in connection with the project and the performance of the work under the contract, whether or not caused in part by a person or entity indemnified by this agreement.

f. In case of any contractual default of the successful offeror, the City, after due notice may procure the goods and/or services detailed in the contract from other sources and hold the successful offeror responsible for all damages including, without limitation, attorneys' fees and any other excess cost occasioned thereby.

F. Employment Discrimination by Contractor Prohibited:

a. During the performance of this contract, the successful offeror agrees as follows:

i. The successful offeror will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The successful offeror agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

ii. The successful offeror, in all solicitations or advertisements for employees or on behalf of the successful offeror, will state that such contractor is an equal opportunity employer.

iii. Notices, advertisements, and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

b. The successful offeror shall include the provisions of the foregoing paragraphs of this section in every subcontract or purchase order of over $10,000 so that the provisions will be binding upon each subcontractor or vendor.

G. Compensation:

a. The successful offeror shall be required to submit a complete itemized invoice on each delivery or service which he or she may perform under the contract.

H. Cancellation:

a. The City reserves the right to terminate the contract immediately (*i*) in the event that the successful offeror discontinues or abandons operations; (*ii*) is adjudged bankrupt or reorganized under any bankruptcy law; or (*iii*) fails to keep in force any required insurance policies or bonds.

b. Failure of the successful offeror to comply with any section or part of its contract will be considered grounds for immediate cancellation of the contract by the City.

c. If the successful offeror has not breached the contract but the City cancels it, the offeror will be paid by the City for all scheduled work completed satisfactorily by the successful offeror up to the termination date set in the written cancellation notice.

I. Claims and Appeals:

All claims against the City and appeals of City decisions shall be made in strict accord with the City's Procurement Policy. Compliance with the policy is mandatory.

J. Historically Underutilized Businesses:

Pursuant to General Statute 143-148 and Executive Order # 150, The City of Statesville invites and encourages participation in this procurement process by businesses owned by minorities, women, disabled, disabled business enterprises and non-profit work centers for the blind and severely disabled.

K. Insurance:

Bidder shall maintain insurance coverage's and will provide Certificate of Insurance to the City naming the City of Statesville as additional insured. Failure to keep insurance in force will be cause for the City of Statesville to immediately cancel the contract.

Insurance Minimums: General Liability $1,000,000, occurrence based; Auto Liability $1,000,000, combined single limit for bodily injury and property damage; Workers Compensation, statutory limit.

L. Terms and Conditions:

By bidding of this proposal, vendor, contractors, and/or subcontractors affirm they have read and accept our Purchasing Terms and Conditions. Our Terms and Conditions can be found at www.statesvillenc.net/vendors

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WATER TREATMENT PLANT SCADA PLC SYSTEM SPECIFICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This document covers work necessary for the design, documentation, assembly, installation, field testing, startup, training, and final documentation for an upgraded Water Treatment Plant SCADA PLC system, as described herein. Major components of this system shall include the specified materials, equipment, and installation required to implement a complete and operational Water Treatment Plant SCADA PLC system. PLC and communications equipment shall be installed at the City's Water Treatment Plant. The system shall communicate and integrate with existing communications from the upgraded remote water system facilities.

1.2 GENERAL REQUIREMENTS

A. Electrical: All wiring shall be in complete conformance with the National Electric Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required. For ease of servicing and maintenance, all wiring shall be color coded and uniquely numbered. The wire color code and number shall be clearly shown on the drawings, with each wire's color and number indicated.

1.3 QUALITY ASSURANCE

A. General: The system provider (hereafter referred to as Contractor) shall be responsible for and shall provide for the design, supply, delivery, installation, certification, calibration and adjustment, software configuration, testing and startup, owner training, warranty, and routine future field services, of a complete coordinated system which shall perform the specified functions.

B. Standard Products: In order to achieve standardization for appearance, operation, maintenance, spare parts and manufacturer's service, to the greatest extent practical, like items of equipment provided hereunder shall be the end products of the same manufacturer.

C. UL508A Certification: The Contractor performing the work shall provide documentation that they are a UL508A listed panel shop prior to beginning work on the project.

1.4 SUBMITTALS

A. Hardware Submittals: Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Owner for their review copies of submittal documents. Submittals shall include full details, shop drawings, catalog cuts, and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the Contractor shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. Required documentation sets shall be furnished in bound hardcopy if requested, and final documentation shall also be provided in electronic format on CD or USB Flash Drive.
2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring

requirements identified.

3. Operational Description shall include the principal functions/capabilities of each PLC as provided and configured /programmed. Included shall be a description of system communications.
4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.

B. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.

C. Spares and Expendable Recommendations: The Contractor shall provide a list of recommended spares and expendable items. A total purchase cost for the recommended list shall be provided in addition to the unit cost for each item. The list shall be exclusive of any spares furnished under this Contract. Spare parts required for this Contract are listed in Section 2.3.I.

1.5 OPERATION AND MAINTENANCE MANUALS AND SOFTWARE

A. General: The Contractor shall provide two complete hard-covered, ring bound, loose-leaf O&M manuals as well as one digital copy. In addition to "as-built" system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under this section. Wiring diagrams shall be provided for any provided equipment panels and shall include colors and unique numbers for all panel wires.

The submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing, and maintenance of each component and/or instrument.

Operation and Maintenance manuals shall include copies of all PLC programs written to accomplish the monitoring and control functions specified. Programs shall be updated after startup is complete, with the fully commented program(s) licensed to and provided to the Owner on compact disk (CD) or USB Flash Drive.

All software and tools required for configuring and programming RTU's, PLC's, and SCADA software shall be provided and licensed to the Owner. All custom programing shall be licensed to Owner for their use on existing facilities and as a base for future expansion of system.

The contents of the O&M manuals shall include the following sections:

1. System Hardware/Installation
2. System Software
3. Operation
4. Maintenance and Troubleshooting

PART 2 - PRODUCTS

2.1 GENERAL

A. General: The functions and features specified herewith are the minimum acceptable requirements for the SCADA PLC system. The provided system shall equal or exceed each requirement. In some cases, the specifications may allow the accomplishing of certain functions by means of more than one hardware/firmware/software approach. Any approach that is proposed shall equal or exceed all functional, operational, convenience and maintenance aspects of the one described with the City approving any deviations major or minor. Major equipment, component and software items are specified; however, the Contractor shall provide all appurtenant items necessary to

achieve the required operation as hereinafter specified.

B. Existing System Overview: The City operates a 15 MGD conventional water treatment plant (WTP). The existing SCADA PLC system consists of networked Allen-Bradley programmable controllers (PLC) communicating via Allen-Bradley Data Highway (DH+). The existing SCADA system is not connected to the Internet, and it is desired that the upgraded SCADA PLC and Radio hardware remain unconnected to the Internet after installation and startup are completed.

C. Proposed System Overview: The new SCADA PLC hardware will be the latest version of Allen-Bradley CompactLogix. Hardware replacements shall be installed in Filter Consoles 1-10, Generator Building RTU, Main Control RTU, Chemical Building RTU, and Raw Water Vault RTU. All installations shall be connected using fiber optic cable with new media converters. Power supplies and UPS equipment shall also be replaced. Instrumentation, tank levels, and all available equipment status indicators currently monitored by the existing SCADA PLC system shall be monitored by the new SCADA hardware. Unless otherwise noted, this upgrade does not include replacement of filter consoles, control panels, instrumentation, or connected field equipment outside of the RTU.

2.2 SCADA SYSTEM SCOPE OF WORK

A. General: One (1) fully wired and tested RTU subpanel shall be installed at the City's Water Treatment Plant to serve as a central monitoring and control station. The subpanel will be installed inside the existing PLC-12 Master PLC. Thirteen (13) PLC Racks with fiber optic communications equipment shall be installed in Filter Consoles 1-10, PLC-11 Generator RTU, PLC-13 Chemical Building RTU, and PLC-14 Raw Water Vault. Operator interface screens shall be installed in Filter Consoles 1-10, PLC-13 Chemical Building, and PLC-14 Raw Water Vault.

B. Site Specific Description of Work: The SCADA PLC equipment shall be installed and programmed as described below with any specific features identified. Specifications for major components follow this section. All panel construction shall have standardized components and general layout to provide uniformity and facilitate future troubleshooting and maintenance. Upgrades listed below shall be mounted, wired, and tested prior to delivery to the City. All panels provided shall be constructed in a UL508A listed panel shop.

1. PLC-1 / 10 Filter Consoles 1-10 PLC Upgrades
    a. The PLC components shall be installed into the existing Filter Console in the same location as the existing SLC PLC equipment.
    b. CompactLogix PLC components shall be used for compatibility and uniformity. A minimum of one (1) CPU, one (1) power supply module, two (2) analog input modules, one (1) analog output module, two (2) digital input modules and two (2) digital output modules shall be provided. Programming will be provided as part of this work.
    c. The existing operator interface terminal shall be replaced with a new unit. All functionality for automatic backwash controls, and filter flow controls shall be equal to or greater than the existing units.
    d. Surge arrester for 120 VAC control power shall be installed in the panel assembly in the same location as the existing arrester and connected to incoming AC power.
    e. A minimum 1500VA uninterruptible power supply shall be provided for each filter console. Panel wiring shall be such that the UPS can be installed or bypassed using factory UPS cord connections. Power failure will be monitored by the SCADA computer.
    f. Connection and integration to the existing SCADA Computers and any associated addressing or display changes shall be completed as part of this upgrade.

g. Panel Components

- One (1) eight port DIN-rail mounted unmanaged Ethernet media converter shall be provided for connection of Ethernet compatible devices and fiber optic communication cabling to the remainder of the PLC network. The fiber optic connectors shall be Type ST.
- Existing fiber optic jumpers between each Filter Consoles will be replaced. The fiber optic connectors shall be Type ST.
- The existing receptacle for powering a programming device shall be retained.
- There are two DC power supplies in each Filter Console. The 24 VDC power supply shall be replaced. The 5 VDC power supply shall be removed along with the existing fiber optic media converter. The 24 VDC power supply shall be rated to supply the Operator Interface Terminal along with any other DC loads with a minimum rating of five (5) amps.
- Power supplies, PLC equipment, operator interface terminals, and media converters shall be protected by individual fuses or breakers in addition to the main control panel breaker.
- Pilot lights, selector switches, and pushbuttons located on the Filter Console top shall be replaced. Any illuminated device shall utilize LED technology. Pilot lights shall be installed so that 'closed-off' indications are red, and 'open-running' indications are green. Other indications shall remain as currently installed.
- Nameplates shall not be replaced unless damage occurs during pilot device installation.
- Digital indicators for Loss of Head, Turbidity, and Level shall be replaced. The existing Effluent Flow controller will be replaced with a digital indicator as well. A cover plate shall be provided for the cutout.
- Filter No.10 Filter Console shall be connected to PLC-11 Generator RTU by 6 fiber multimode fiber optic cable as part of this project. Termination panels shall be provided as part of the installation.

h. Software/Programming Requirements

- Filter Effluent Flow shall be controlled by the Filter Console PLC in Semi-Automatic and by the Effluent Valve selector switch in Manual.
- Automatic Filter Effluent flow control will be achieved by a Filter Flow setpoint in the SCADA computer. This setpoint will be divided for each active filter, and the individual flow setpoint will be used to determine desired filter flow.
- Automatic backwash setpoints shall be entered using the Operator Interface Terminal at each Filter Console. All existing setpoints shall be adjustable by the operator from the Filter Console or the SCADA Computer. This programming is currently not present in the SCADA Computer software and will need to be completed as part of this project.
- The existing Filter Consoles utilize automatic backwash. Automatic backwash programming shall be required as part of the PLC upgrade. This functionality shall be fully tested with WTP personnel as part of this project.
- Complete manual filter operation functionality shall be maintained for use in the event of PLC or field device failures.
- The existing SCADA PLC System uses messaging commands in PLC-12 Master PLC to move data from each Filter Console to PLC-12 for use by the SCADA computer. The updated PLC system shall not require a 'Polling Master' arrangement, but instead each PLC will be directly monitored by the

SCADA computer. This programming shall be required as part of this project.

2. PLC-11 Generator Building RTU Upgrades
    a. The PLC components shall be installed into the existing PLC-11 Generator Building RTU in the same location as the existing SLC PLC equipment.
    b. CompactLogix PLC components shall be used for compatibility and uniformity. A minimum of one (1) CPU, one (1) power supply module, one (1) digital input module, one (1) relay output module, and one (1) analog input module shall be provided. Programming will be provided as part of this work.
    c. Surge arrester for 120 VAC control power shall be installed in the panel assembly and connected to incoming AC power for PLC-11.
    d. A minimum 1000VA uninterruptible power supply shall be provided for PLC-11. Panel wiring shall be such that the UPS can be installed or bypassed using factory UPS cord connections. Power failure will be monitored by the SCADA computer.
    e. Connection and integration to the existing SCADA Computers and any associated addressing or display changes shall be completed as part of this upgrade.
    f. Panel Components
        - One (1) eight port DIN-rail mounted unmanaged Ethernet media converter shall be provided for connection of Ethernet compatible devices and fiber optic communication cabling to the remainder of the PLC network. The fiber optic connectors shall be Type ST.
        - One (1) 24 VDC power supply shall be replaced with a power supply with a minimum rating of five (5) amps.
        - Power supplies, PLC equipment, and media converters shall be protected by individual fuses or breakers in addition to the main control panel breaker.
        - PLC-11 Generator RTU shall be connected to Filter No.10 Filter Console by 6 fiber multimode fiber optic cable as part of this project. Termination panels and connector housings shall be provided as part of the installation.
    g. Software/Programming Requirements
        - The existing SCADA PLC System uses messaging commands in PLC-12 Master PLC to move data from each RTU to PLC-12 for use by the SCADA computer. The updated PLC system shall not require a ‘Polling Master’ arrangement, but instead each PLC will be directly monitored by the SCADA computer. This programming shall be required as part of this project.

3. PLC-12 Master PLC RTU Upgrades
    a. Construct the RTU back panel with components mounted on a Hoffman A36P30 panel. The completed unit will be installed into the existing PLC-12 RTU.
    b. CompactLogix PLC components shall be used for compatibility and uniformity. A minimum of one (1) CPU, one (1) power supply module, two (2) digital input modules, one (1) relay output module, and two (2) analog input modules shall be provided. Programming will be provided as part of this work.
    c. Surge arrester for 120 VAC control power shall be installed in the panel assembly and connected to incoming AC power for PLC-12.
    d. A minimum 1000VA uninterruptible power supply shall be provided for PLC-12. Panel wiring shall be such that the UPS can be installed or bypassed using factory UPS cord connections. Power failure will be monitored by the SCADA computer.
    e. Connection and integration to the existing SCADA Computers and any associated

addressing or display changes shall be completed as part of this upgrade.

f. Panel Components

- One (1) eight port DIN-rail mounted unmanaged Ethernet media converter shall be provided for connection of Ethernet compatible devices and fiber optic communication cabling to the remainder of the PLC network. The fiber optic connectors shall be Type ST.
- One (1) 24 VDC power supply shall be provided with a power supply with a minimum rating of five (5) amps.
- A receptacle for powering a programming device shall be provided.
- Power supplies, PLC equipment, and media converters shall be protected by individual fuses or breakers in addition to the main control panel breaker.

g. Software/Programming Requirements

- The existing SCADA PLC System uses messaging commands in PLC-12 Master PLC to move data from each Filter Console to PLC-12 for use by the SCADA computer. The updated PLC system shall not require a 'Polling Master' arrangement, but instead each PLC will be directly monitored by the SCADA computer. This programming shall be required as part of this project.

4. PLC-13 Chemical Building RTU Upgrades

a. The PLC components shall be installed into the existing PLC-13 Chemical Building RTU in the same location as the existing SLC PLC equipment.

b. CompactLogix PLC components shall be used for compatibility and uniformity. A minimum of one (1) CPU, one (1) power supply module, one (1) digital input module, one (1) relay output module, three (3) analog input modules, and four (4) analog output modules shall be provided. Programming will be provided as part of this work.

c. The existing operator interface terminal shall be replaced with a new unit. All functionality for chemical feed controls shall be equal to or greater than the existing units.

d. Surge arrester for 120 VAC control power shall be installed in the panel assembly and connected to incoming AC power for PLC-13.

e. Existing surge protection for analog input and output wiring located inside PLC-13 control panel shall be replaced.

f. A minimum 1000VA uninterruptible power supply shall be provided for PLC-13. Panel wiring shall be such that the UPS can be installed or bypassed using factory UPS cord connections. Power failure will be monitored by the SCADA computer.

g. Connection and integration to the existing SCADA Computers and any associated addressing or display changes shall be completed as part of this upgrade.

h. Panel Components

- One (1) eight port DIN-rail mounted unmanaged Ethernet media converter shall be provided for connection of Ethernet compatible devices and fiber optic communication cabling to the remainder of the PLC network. The fiber optic connectors shall be Type ST.
- One (1) 24 VDC power supply shall be replaced with a power supply with a minimum rating of five (5) amps.
- Power supplies, PLC equipment, operator interface terminals, and media converters shall be protected by individual fuses or breakers in addition to the main control panel breaker.

i. Software/Programming Requirements

- Chemical feed pumps shall maintain speed control outputs from the PLC for fluoride (2), orthophosphate (2), caustic (3), alum (2), and sodium hypochlorite (4) pumps currently wired into the system. This will be considered Manual mode of operation. There are thirteen (13) chemical feed pumps currently in operation.
- Flow pacing shall be added for all chemical feed pumps based on either the Raw or Finished Water flows and will be considered Auto mode of operation. As part of the flow pacing controls, the operator will also be available to adjust chemical feed dosage in Auto mode.
- The existing SCADA PLC System uses messaging commands in PLC-12 Master PLC to move data from each RTU to PLC-12 for use by the SCADA computer. The updated PLC system shall not require a 'Polling Master' arrangement, but instead each PLC will be directly monitored by the SCADA computer. This programming shall be required as part of this project.

5. PLC-14 Raw Water Vault RTU Upgrades

a. The PLC components shall be installed into the existing PLC-14 Raw Water Vault RTU in the same location as the existing SLC PLC equipment.

b. CompactLogix PLC components shall be used for compatibility and uniformity. A minimum of one (1) CPU, one (1) power supply module, three (3) digital input modules, two (2) relay output modules, one (1) analog input module, and one (1) analog output module shall be provided. Programming will be provided as part of this work.

c. The existing operator interface terminal shall be replaced with a new unit. All functionality for chemical feed controls shall be equal to or greater than the existing units.

d. Surge arrester for 120 VAC control power shall be installed in the panel assembly and connected to incoming AC power for PLC-14.

e. A minimum 1000VA uninterruptible power supply shall be provided for PLC-14. Panel wiring shall be such that the UPS can be installed or bypassed using factory UPS cord connections. Power failure will be monitored by the SCADA computer.

f. Connection and integration to the existing SCADA Computers and any associated addressing or display changes shall be completed as part of this upgrade.

g. Panel Components

- One (1) eight port DIN-rail mounted unmanaged Ethernet media converter shall be provided for connection of Ethernet compatible devices and fiber optic communication cabling to the remainder of the PLC network. The fiber optic connectors shall be Type ST.
- One (1) 24 VDC power supply shall be replaced with a power supply with a minimum rating of five (5) amps.
- Power supplies, PLC equipment, operator interface terminals, and media converters shall be protected by individual fuses or breakers in addition to the main control panel breaker.

h. Software/Programming Requirements

- Raw Water Flow control currently uses PID control for flow control. In SCADA-Auto mode, plant personnel enter the desired flow setpoint, and the Raw Water Control Valve is modulated automatically to maintain the desired flow. In SCADA-Manual mode, the valve can be modulated based on percent open. This functionality shall be maintained as part of this project.

- Existing flocculator and sludge collector controls are currently started manually and shall be maintained.
- The existing SCADA PLC System uses messaging commands in PLC-12 Master PLC to move data from each RTU to PLC-12 for use by the SCADA computer. The updated PLC system shall not require a 'Polling Master' arrangement, but instead each PLC will be directly monitored by the SCADA computer. This programming shall be required as part of this project.

2.3 SCADA PLC COMPONENT SPECIFICATIONS

A. Programming Laptop: One (1) Programming Laptop Computer shall be provided as part of this project. The laptop shall be a Dell Precision 3571 Workstation Laptop or approved equal with the following features:

1. Processor shall be an Intel Core i7-12800H or greater
2. Operating system shall be Windows 10 Professional for compatibility with programming software. If all specified programming software is compatible with Windows 11 Professional, Windows 11 Professional will be acceptable as the laptop operating system.
3. Laptop shall include 32GB of RAM, 512 GB Solid-State Drive, 4GB Video Card or greater
4. Laptop shall include USB (2), USB-C (2), HDMI, Audio, and SD Card Reader.
5. The latest edition of Rockwell Software Studio 5000 Programming software and RSLinx software shall be provided and licensed to the City of Statesville.
6. The latest edition of C-More EA9 operator interface programming software shall be provided and licensed to the City of Statesville.
7. GE/MDS Element Manager software shall be provided for connection to existing Ethernet radios.
8. DEVCOM2000 software for the laptop communicator and a PC-Based HART communicator shall be provided for programming and configuration of HART compatible plant instrumentation. Software shall be licensed to the City of Statesville.

B. Battery Back Up System: Included with the SCADA PLC Equipment shall be an intelligent battery backup system including battery health logic module, charger and sufficiently sized battery. Battery system shall provide full on-line protection, power conditioning, and a seamless switchover to battery upon detection of main power supply failure. Once main power is restored, the unit shall provide seamless switchback to normal power source and recharge the battery. Battery health logic module shall individually monitor main power supply, battery and converter voltages for low voltage conditions, and provide low voltage cutoff to protect battery from an unrecoverable depletion. An on board LED, or local Operator Interface (OI) if provided shall locally indicate detection of an alarm condition.

1. The battery backup for each of the ten (10) Filter Consoles shall be an APC Smart UPS Model SMT1500C or approved equal.
2. The battery backup for PLC-11, PLC-12, PLC-13, and PLC-14 shall be an APC Smart UPS Model SMT1000C or approved equal.

C. PLC Hardware: Programmable Logic Controllers shall be provided for process control and monitoring at each of the listed SCADA Radio sites. The PLC shall be capable of full process control, telemetry and SCADA operations. These processes will continue independently of the SCADA computer once system setpoints, and control parameters are properly entered.

1. CPU: The Central Processing Unit shall be provided for control of the local RTU's. The CPU shall have two built-in Ethernet/IP ports, one USB port for temporary programming connection, connection of up to 16 processor nodes, and 2 MB of user memory. The CPU shall be an Allen-Bradley 1769-L33ER, as a minimum.

   CompactLogix CPU modules with embedded I/O shall not be used in order to reduce the number of spare parts, and for uniformity through the system.

2. Power Supply Module: The power supply module provides backplane power for the CPU and I/O modules. The power supply module shall be a 1769-PA4.

3. Analog Input Module: The analog input module shall provide 4 or 8 differential outputs for either voltage (-10 to 10 VDC) or current (0/4 to 20 mA) outputs. Resolution is 14 bits with the proper filter selection. The analog input module shall be a 1769-IF4 or a 1769-IF8 provided on analog I/O.

4. Analog Output Module: The analog output module shall provide 4 single-ended outputs for either voltage (-10 to 10 VDC) or current (0/4 to 20 mA) inputs. Resolution is 15 bits. The analog input module shall be a 1769-OF4.

5. Digital Input module (120 VAC): The digital input module used with 120 VAC shall be a 1769-IA16.

6. Digital Output module: The digital output module shall be a 1769-OW16.

D. Operator Interface Terminals (OIT): Each Filter Console, PLC-13, and PLC-14 will be have an OIT for local monitoring and control of pertinent values. Screen shall be a 10" color TFT, analog resistive touch screen with 800 x 600 pixel resolution as a minimum. Three (3) serial ports, one (1) Ethernet port, and two (2) USB ports are required. Acceptable manufacturer shall be C-More EA9-T10CL/WCL Series for uniformity with currently installed OITs at the Water Treatment Plant and remote sites.

E. Media Converters: Each control panel will be connected to the SCADA computer and other panels using the existing multimode fiber optic cable. Fiber optic media converters will be required to convert from fiber to copper Ethernet ports. The existing fiber connectors are ST compatible. A minimum of two (2) fiber optic ports and eight (8) copper Ethernet ports are required. The media converters shall be Red Lion 110FX2-ST.

F. Ethernet Switches: Local communications between PLC, radio, operator interfaces, and programming devices might require the use of unmanaged Ethernet switches for spare Ethernet connectivity. A minimum of eight (8) copper Ethernet ports are required. The Ethernet switches shall be Red Lion 108TX when required.

G. Fiber Optic Cable and Termination Devices: Fiber optic cable and termination devices will be required for installation of an additional fiber link between Filter Console No.10 and PLC-11 Generator Building RTU. Two (2) fiber optic patch panels with Closet Connector Housing will be provided. One patch panel shall be located inside Filter Console No.10 and on shall be located adjacent to the PLC-11 Generator Building RTU. The fiber equipment manufacturer shall be Corning Cable Systems.

   1. Fiber Optic Cable shall be loose tube, gel-free construction with 6 multimode fibers (62.5 MM). Corning FREEDM Model No. 006KSF-T4130D20. Estimated length required is 250 feet.

   2. Fiber optic patch panels shall be NEMA4X fiberglass housing with connector housing mounts. Wall/Panel mounting equipment shall be provided with panel. Corning Model No.EDC-02-NH

   3. Closet connector housing shall be Corning Model No.CCH-CP12-15T.

4. Fiber optic connectors shall be field installable, 62.5 multimode, and ST compatible. Connector ferrule shall be composite with no epoxy or polishing required. Corning Model No.95-000-50.

5. Fiber optic jumpers shall be factory-built, dual fiber, 62.5 multimode, and ST compatible. Length will be approximately 40 feet between Filter Consoles 1-10, and 10 feet between patch panels and media converters at Filter Console No.10 and PLC-11. Corning Model No.505002K51200XXM (XX is length in meters).

H. Control Panels and Auxiliary Equipment: The majority of the work requires the use of Hoffman or Weigmann subpanels. The PLC-12 Main PLC Panel is the only complete subpanel assembly required for this project. Panel and all mounting hardware shall be NEMA12 Mild Steel. Additional equipment is listed as follows.

1. Acceptable Power Supply Manufacturers are Sola SDN, Phoenix Contact Quint, Eaton, or approved equal.
    - Auto Select Voltage 115/230 VAC
    - Power Supplies shall be rated for 24VDC and 5A at a minimum
    - Onboard Power Supply Output Monitoring
    - DIN-Rail Mounting
    - UL Approved

2. Acceptable Digital Indicator Manufacturers are Precision Digital, Red Lion, or approved equal.
    - Digital Indicators shall be supplied with internal 24 VDC power supply for instrument loop power when required.
    - Current (4-20 mA DC) or Voltage (0-10 V) input
    - 1/8 DIN Size, 4 Digit LED Display
    - UL Approved

3. Acceptable Push Button Manufacturers are Allen-Bradley 800FP, Schneider Electric, or approved equal.
    - All panel mount push buttons, selector switches, and pilot lights shall be 22.5 mm in diameter rated for NEMA 4/13 service.
    - Operators shall be constructed of industrial grade thermoplastic.
    - UL Approved
    - All pilot lights or illuminated push buttons shall utilize LED technology.
    - Quantities are as follows for each Filter Console (10 total):
        - Eight (8) Two position maintained selector switch operators with one NC contact and one NO contact
        - Three (3) Three position spring return to center selector switch operators with two NO contacts
        - One (1) Flush head, green push button with one NO contact
        - One (1) Flush head, illuminated, green push button with one NO contact
        - One (1) Extended head, illuminated, red push button with one NO contact
        - Ten (10) Green pilot lights

- Thirteen (13) Red pilot lights
- Two (2) Amber pilot lights

4. Acceptable analog surge protection for analog signal loops using 4-20 mA DC or 0-10VDC shall be Phoenix Contact TTC-6-1X2-24DC-UT. One surge protector per analog signal loop is required. Multiple loop protectors are not acceptable.

I. Spare Part and Expendable List: Spare Parts and Expendables Components are listed below and shall be provided as part of this Contract. This list is based on components directly specified in this document. In the event other components are approved, that equipment will need to be provided in the quantities listed.

1. PLC/OIT Components (Quantity of One (1) Each unless noted)
   - Allen-Bradley 1769-L33ER CPU Module
   - Allen-Bradley 1769-PA2 Power Supply Module
   - Allen-Bradley 1769-PA4 Power Supply Module
   - Allen-Bradley 1769-IF4 Four-Point Analog Input Module
   - Allen-Bradley 1769-IF8 Eight-Point Analog Input Module
   - Allen-Bradley 1769-OF4 Four-Point Analog Output Module
   - Allen-Bradley 1769-IA16 Sixteen-Point 120 VAC Digital Input Module
   - Allen-Bradley 1769-IQ16 Sixteen-Point DC Digital Input Module
   - Allen-Bradley 1769-OW16 Sixteen-Point Relay Output Module
   - Allen-Bradley 1769-ECR End Cap Right Module
   - C-More EA9-T10CL Operator Interface Terminal
   - C-More EA9-T10WCL Operator Interface Terminal

2. Fiber Optic and Radio Components (Quantity of One (1) Each unless noted)
   - GE/MDS SD04 Radio Transceiver
   - Polyphaser IS-B50HN-C2-ME Coaxial Surge Protector
   - Red Lion 110FX2-ST Fiber Optic Media Converter

3. Panel and Auxiliary Components (Quantity of One (1) Each unless noted)
   - Allen-Bradley 800F-PN5G Green LED Module (Qty of 2)
   - Allen-Bradley 800F-PN5R Red LED Module (Qty of 2)
   - Allen-Bradley 800F-PN5W White LED Module (Qty of 2)
   - Allen-Bradley 800F-PX11 Latch with 1 NO/1 NC Contacts (Qty of 3)
   - Phoenix Contact TTC-6-1X2-24DC-UT (Qty of 3)
   - Precision Digital PD765 Digital Indicator
   - Sola SDN5-24-100P Power Supply

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Equipment specified in this section shall be installed in accordance with the manufacturer's recommendations and all applicable codes. Specific installation and programming descriptions are included with each site scope of work.

B. Field Service: The Contractor shall provide experienced personnel to for installation, adjustment, testing, and startup of the system. All elements of the system shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents. The Contractor shall provide all special testing materials and equipment required. The Contractor shall coordinate and schedule all of his testing and startup work with the Owner. As a minimum, the testing shall include both a factory test and a field test.

C. Training: The training program shall educate operators, maintenance, engineering, and management personnel with the required levels of system familiarity to provide a common working knowledge concerning all significant aspects of the system being supplied. The training program shall include a minimum of two trips with a minimum of 8 hours on-site instruction per trip (minimum 16 hour total on-site) after all final programming modifications and testing have been performed. At least two weeks prior to the requested start of the program, the proposed dates of training shall be submitted to the Owner for approval. The supplier shall provide all instructional course material, equipment and manuals to conduct the training program.

END OF SECTION